The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An atherectomy device for ablating an occlusion in a patient's vessel, comprising:

a flexible drive shaft;

an ablation burr rotationally coupled to the drive shaft, the ablation burr having a proximal end including at least one flexible annular disk having a center hole and an outer edge, the annular disk having an abrasive disposed on a forwardly facing surface and a distal end comprising a nose member having an abrasive leading surface; and

a catheter extending over the drive shaft, the catheter adapted to slidably receive the at least one flexible annular disk in a folded configuration.

2. The atherectomy device of Claim 1, further comprising a support member secured to the drive shaft wherein the at least one flexible annular disk is received by the support member.

3. The atherectomy device of Claim 2, wherein the at least one flexible annular disk has a plurality of radial cuts therethrough, the radial cuts each having a first end disposed at a location radially outward from the center hole and a second end disposed at the outer edge, the radial cuts defining a plurality of disk segments.

4. The atherectomy device of Claim 3, wherein the at least one flexible annular disk further comprises a plurality of small holes disposed at the first end of each radial cut.

5. The atherectomy device of Claim 3, wherein the at least one flexible annular disk comprises at least three flexible annular disks that are axially spaced apart and attached to the support member, the at least three flexible annular disks having different diameters.

6. The atherectomy device of Claim 1, wherein the abrasive comprises a plurality of diamond particles affixed to the forwardly facing surface of the flexible annular disk.

7. The atherectomy device of Claim 6, wherein diamond particles are affixed to the nose portion to form the abrasive leading surface.

8. The atherectomy device of Claim 6 wherein the nose portion has an abrasive surface formed by machining grooves into the nose portion.

9. An atherectomy device for ablating an occlusion in a patient's vessel, comprising:

a flexible drive shaft;

an ablation burr coupled to the drive shaft, the burr including an elongate, generally cylindrical support member fixedly attachable to the drive shaft in axial alignment therewith, and a panel spiraling radially outward, the panel having an outer surface and an edge disposed generally parallel to and spaced from the cylindrical support member forming a gap therebetween, the panel having an uncompressed state wherein the gap between the edge and the support member is relatively wide and an elastically compressed state wherein the gap between the edge and the support member is relatively narrow, the panel further comprising an abrasive disposed on the outer surface; and

a catheter extending over the drive shaft, the catheter adapted to slidably receive the ablation burr with the panel in the compressed state.

10. The atherectomy device of Claim 9, wherein the panel is made from a semi-rigid elastomeric material that will return to the uncompressed state in the absence of compressive forces.

11. The atherectomy device of Claim 10 wherein the abrasive comprises diamond particles.

12. An atherectomy device for ablating an occlusion in a patient's blood vessel, comprising:

a flexible drive shaft;

an ablation burr coupled to the drive shaft, the burr including a hub fixedly attachable to the drive shaft and a plurality of spaced apart abrasive flexible struts connected to the hub and extending forwardly from the hub, the plurality of struts defining a burr volume having a proximal portion that increases in radius from the hub and a distal portion that decreases in radius from the proximal portion to the

distal end of the burr, the ablation burr further comprising an compressible body substantially filling the burr volume formed by the struts; and

a catheter extending over the drive shaft, the catheter being adapted to compress the burr body and slidably receive the ablation burr with the flexible struts compressed.

13. The atherectomy device of Claim 12 wherein the proximal portion of the burr volume is convex and the distal portion is concave, wherein the concave forward portion comprises an abrasive outer surface.

14. The atherectomy device of Claim 13 wherein the compressible body comprises a hollow bladder that attaches to the plurality of struts.

15. The atherectomy device of Claim 14 wherein the hollow bladder is made from an elastomeric material.

16. The atherectomy device of Claim 13 wherein the abrasive outer surface comprises a plurality of diamond particles affixed to the concave distal portion.

17. An atherectomy device for ablating an occlusion in a patient's blood vessel, comprising:

a flexible drive shaft;

an ablation burr coupled to the drive shaft, the burr including a plurality of plastically deformable wires having a proximal end and a distal end, wherein the wire proximal ends are attached to the drive shaft at a first axial location, in circumferentially spaced positions, and the wire distal ends are attached to the drive shaft at a second axial location, forward of the first axial location, in corresponding circumferentially spaced positions, such that the plurality of wires can be deformed to define a generally ellipsoidal volume, and ii) a flexible sheath disposed over the plurality of wires enclosing the generally ellipsoidal volume, the flexible sheath having a leading abrasive surface, wherein the burr can be compressed by plastically deforming the wires and can be returned to a generally ellipsoidal shape by rapidly spinning the drive shaft; and

a catheter extending over the drive shaft, the catheter being adapted to compress the burr body and slidably receive the ablation burr.

18. The atherectomy device of Claim 17 wherein the deformable wires are stainless steel.

19. The atherectomy device of Claim 17 wherein the deformable wires are a shape memory alloy.

20. The atherectomy device of Claim 17 wherein the flexible sheath is an elastomer and the abrasive leading surface is formed by affixing diamond particles to the elastomer.

21. The atherectomy device of Claim 17 wherein the burr further comprises a trailing surface having a hydrophilic coating.

22. An atherectomy device for ablating an occlusion in a patient's blood vessel, comprising:

a drive shaft having a distal end;

an ablation burr comprising a nose attached to the distal end of the drive shaft and a shell extending proximally from the nose, wherein the nose has a leading surface, and the shell has a semi-rigid center portion having a maximum diameter greater than the nose, wherein the semi-rigid center portion can be elastically deformed to reduce its maximum diameter, and the semi-rigid center portion further comprises an abrasive outer surface; and

a catheter extending over the drive shaft, the catheter being adapted to slidably receive the ablative burr with the elastically deformed center portion.

23. The atherectomy device of Claim 22 wherein the shell is formed from a semi-rigid elastomer.

24. The atherectomy device of Claim 23 wherein the elastomer is polyurethane.

25. The atherectomy device of Claim 22 wherein the leading surface of the nose portion is abrasive.

26. The atherectomy device of Claim 25 wherein the abrasive leading surface of the nose portion is formed by affixing diamond particles to the nose portion.